

ABSTRACT OF THE DISCLOSURE

A method for etching a deep trench in a substrate. A multi-layer hard mask structure is formed overlying the substrate, which includes a first hard mask layer and at least one second hard mask layer disposed thereon. The first hard mask layer is composed of a first boro-silicate glass (BSG) layer and an overlying first undoped silicon glass (USG) layer and the second is composed of a second BSG layer and an overlying second USG layer. A polysilicon layer is formed overlying the multi-layer hard mask structure and then etched to form an opening therein. The multi-layer hard mask structure and the underlying substrate under the opening are successively etched to simultaneously form the deep trench in the substrate and remove the polysilicon layer. The multi-layer hard mask structure is removed.